produces marsh gas (methane). We learn from the *Zeitschrift für Elektrochemie* (vol. xii., p. 20) that in St. Alban, France, a carbide is now being manufactured from which ethylene is evolved when it is acted upon by water. The ethylene so obtained is pumped into sulphuric acid, by which it is absorbed with production of ethyl hydrogen sulphate. Now when ethyl hydrogen sulphate is acted upon by water, alcohol and sulphuric acid are produced. By distillation the alcohol can be obtained free from the sulphuric acid, and the sulphuric acid can again be obtained in the concentrated condition by evaporation. Furthermore, the metallic oxide which is used in the production of the carbide is again obtained when the carbide is acted upon by water, so that the production of alcohol is summed up in the equation carbon+energy=alcohol. Up to the present it has been found necessary to use four times the quantity of carbon which should theoretically be required. How much more energy it is necessary to employ than is required by the theory is not stated. We remember that so far back as 1893, when the calcium carbide industry was in its infancy, it was suggested that the acetylene might by reduction with hydrogen be converted into ethylene, and the ethylene so obtained be employed for the manufacture of alcohol. In fact, we believe that several patents were taken out upon the subject. Owing to the difficulty of reducing acetylene, the process could hardly be expected to be a success. In the present case, however, provided the formation of the carbide is not too costly and the recovery of the sulphuric acid and metallic oxide not too expensive, the process seems to possess at any rate the elements of success.

THE first part has been received of an "Atlas of the World's Commerce," by Mr. J. G. Bartholomew, which is to be published by Messrs. George Newnes, Ltd., in twenty-two parts. The parts, which cost 6*d*. each net, are to appear fortnightly.

MR. DAVID NUTT has issued a ninth edition of the late Prof. A. Milnes Marshall's well known book on "The Frog: an Introduction to Anatomy, Histology, and Embryology." The work has been edited by Dr. F. W. Gamble, who has revised the chapter on development and added some figures.

A NEW monthly periodical, entitled *Science and Technology*, price sixpence net, has just appeared. It is intended to be of interest and assistance to teachers and students. The first number contains articles dealing with educational administration, examination syllabuses, and reports of meetings. The only contribution of a wholly scientific character is a reprint of Prof. S. P. Thompson's lecture at the Royal Institution on the electric production of nitrates from the atmosphere.

A THIRD edition of Sir William Ramsay's "Gases of the Atmosphere. The History of their Discovery," has been published by Messrs. Macmillan and Co., Ltd. The first edition of the book, published in 1896, included a non-technical description of argon, discovered in the atmosphere in 1894. To the second edition of 1900 a new chapter was added describing the other four inactive gases discovered to be present in air—helium, separated from the atmosphere in 1900, and neon, krypton, and xenon, discovered in 1898, and separated from argon and from each other during 1899 and 1900. The present edition has also been enlarged by the addition of another chapter, this one treating of the radio-active gases produced by the disintegration of radium and radium-thorium, which have been added recently to the list of constituents of the atmosphere.

OUR ASTRONOMICAL COLUMN.

COMET 1906*c*.—From observations made on March 19, 20, and 21, Dr. Strömgren has computed the following elements and ephemeris for the comet discovered by Mr. Ross on March 18:—

Elements.

$$T = 1906 \text{ Feb. } 22{\cdot}216 \text{ Berlin M.T.}$$

$$\left.\begin{aligned} \infty &= 281^\circ\ 24'{\cdot}1 \\ \Omega &= 73^\circ\ \ 2'{\cdot}1 \\ i &= 80^\circ\ 34'{\cdot}0 \end{aligned}\right\} 1906{\cdot}0$$

$$\log q = 9{\cdot}88336$$

Ephemeris 12h. M.T. Berlin.

1906		α h. m. s.		δ ° ′		log Δ		Brightness
Mar. 29	...	2 38 33	...	+ 4 11·5	...	0·2356	...	0·63
April 2	...	2 48 40	...	+ 7 38·4	...	0·2547	.	0·53
6	...	2 58 9	..	+10 47·5	...	0·2732	...	0·44

(*Kiel Circular*, No. 87.)

OBSERVATION OF COMET 1905*c* AFTER PERIHELION.—A letter received from Prof. H. R. Morgan (Glasgow, U.S.A.) by Prof. Pickering states that the former observed Giacobini's comet, 1905*c*, on February 21, that is, since it appeared to the east of the sun.

The comet's apparent position at 7h. 40m. 44s. (Glasgow M.T.) was $\alpha = 1\text{h. } 8\text{m. } 29{\cdot}2\text{s.}$, $\delta = -11^\circ\ 9'\ 11''$, which gave corrections of −11s. and $-3'{\cdot}4$ to Herr Wedemeyer's ephemeris on the date of observation (*Astronomische Nachrichten*, No. 4079).

NEW VARIABLE STARS IN THE REGION ABOUT γ SAGITTÆ.—From the comparison of several photographs taken with the Bruce telescope, Prof. Wolf has discovered fifty-five new variable stars in the region about γ Sagittæ.

In No. 4079 of the *Astronomische Nachrichten* he gives the details concerning the discovery and measurement of each star, and, in addition, a list showing the position (1855·0) and the magnitude on various dates between 1900·7 and 1905·7. Forty-seven circular charts which accompany the paper show the region immediately surrounding each variable.

THE SUPPOSED NEBULOSITY AROUND NOVA AQUILÆ NO. 2.—In the opinion of Prof. Frost, the suggestion that the nebulous appearance of images of Nova Aquilæ No. 2 is entirely due to chromatic aberration is the correct one.

Plates taken with the 24-inch *reflector* at Yerkes Observatory on September 21 and 27, and October 23, 1905, show no nebulosity, whilst Prof. Wolf has obtained similar effects to this apparent nebulosity with other stars having peculiar spectra. A third argument against the phenomenon being due to true nebulosity is that, in order to produce the image obtained, the intrinsic brightness would have to be at least 1800 times as bright, in proportion to the light of the star, as that of the nebula known to exist around Nova Persei (*Astronomische Nachrichten*, No. 4079).

SOME TESTS OF THE SNOW TELESCOPE.—A very interesting note by Prof. Hale, published in No. 1, vol. xxiii., of the *Astrophysical Journal*, describes the present condition, and some tests, of the large Snow telescope which has been erected at the Solar Observatory, Mount Wilson.

The greatest inconvenience encountered in the early use of this instrument was in connection with the spectroheliograph work. Three mirrors are employed, of which the first, the 30-inch cœlostat mirror, reflects the solar rays on to a 24-inch plane mirror, which in turn directs the beam on to the 24-inch concave mirror of 60-feet focus, which forms the image of the sun on the primary slit.

When the instrument was used, with a high sun, on a hot, windless day, it was found that a serious change of focus, amounting in some cases to 12 inches, occurred, and, worse still, the mirrors became distorted, giving a difference of focus for the opposite limbs of the image of as much as 3 inches.

On days when a cool breeze blew across the surface of the mirror the change was less, so arrangements have now been made to send a current of air across the face of each mirror between the exposures, by means of fans.

Prof. Hale has found that an hour after sunrise is the best time for solar work, and after that an hour before sunset.

© 1906 Nature Publishing Group

Experiments are being carried out for the purpose of discovering some good substitute for glass in mirror making. "Invar" has proved to be too soft, and the fused quartz discs have not been a success. Prof. Hale suggests that speculum metal will be found to answer the purpose better than glass.

Photographs taken with the Snow telescope have proved better than those obtained with the 40-inch refractor at Yerkes, and Prof. Hale states that, from a mechanical standpoint also, the telescope has proved completely successful.

STUDIES ON THE SYNTHESIS OF PEPTIDES AND PROTEIDS.[1]

AMONG the many brilliant achievements in synthetic chemistry accomplished by Prof. Emil Fischer during the last quarter of a century, none have surpassed in interest the remarkable series of researches which formed the subject of a recent address to the German Chemical Society.

In reading this address it is impossible to say which commands greater admiration, the author's consummate skill and endless resource in sweeping aside each difficulty as it arose in a most intricate field of experimental inquiry, or his intense and ceaseless activity in producing almost month by month during the past five years a wealth of new knowledge of the very first importance to biological science.

"Whilst our cautious colleagues," says Prof. Fischer, "fear that a systematic study of this group of compounds (the proteids) will be beset with endless difficulties on account of their troublesome physical features, there are others, among whom I count myself, who are more optimistic, and hold that an attempt at least ought to be made with every modern appliance to lay siege to this unconquered citadel; for it is only by a bold attempt that the limitations of our present methods can be adequately gauged."

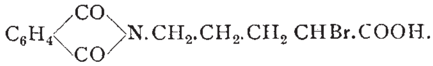
The success which has so far attended Prof. Fischer's first attack promises a speedy capitulation. The proteids will then be made to deliver up the key to their molecular structure, and the first real advance in biochemistry will have been accomplished.

Although physiological chemistry has done much in the past in the way of classifying the numerous members of the proteid group, in preparing a few members in the crystalline form, in attaching to different individuals different biological functions, and in ascertaining the fundamental changes effected by ferment action, our knowledge of their chemical constitution has up to the present been extremely meagre. Apart from the percentage composition, it is limited mainly to the results of hydrolysis by acids, alkalis, or digestive ferments. When submitted to these agents all proteids yield successively albumoses, peptones, and, finally, amino-acids. Of the nature of the first two we are but little better informed than of that of the proteids themselves.

The study of the amino-acids has been attended with more success, for not only has the structure of the majority of them been ascertained, but many have been prepared synthetically. The following is a list of amino-acids obtained by hydrolysing one or other of the natural proteids:—

Glycine
Alanine
Aminovaleric acid
Leucine
Isoleucine
Phenylalanine
Glutamic acid
Aspartic acid
Cysteine
α-Pyrrolidine carboxylic acid (proline)
Hydroxy-pyrrolidine carboxylic acid (oxypyroline)
Serine (α-amino-β-hydroxypropionic acid)
Tyrosine
Tryptophane (skatolaminoacetic acid)
Lysine
Arginine
Histidine
Diaminotrihydroxydodecanic acid
Diaminoglutaric acid
Diaminoadipic acid
Hydroxyaminosuccinic acid
Dihydroxyaminosuberic acid

It was to the study of these acids—the fragments, so to speak, of the albumin molecule—that Fischer first directed his attention, hoping ultimately by piecing them together to construct the simplest of the albumins. In the synthesis of the monoamino-acids Fischer has added to the methods already known that of brominating the alkyl malonic esters and then converting the corresponding acid into the α-bromo-fatty acid, which with ammonia yields the amino-acid. He has, moreover, devised an ingenious process for resolving the synthetic, and, consequently, inactive compounds into their active components. The amino-acids are such weak acids that they refuse to form crystalline salts with the active alkaloids. By converting them into the benzoyl or formyl derivatives, strong acids are produced which may be easily resolved by the ordinary process of fractionally crystallising the salts of the active bases. The diamino-acids, such as ornithine (αδ-diaminovaleric acid) and lysine (αε-diaminocaproic acid), both common products (the former as arginine) of proteid hydrolysis, have also been synthesised by Fischer by adapting Gabriel's reaction in one case and that of Blank in the other. Gabriel's phthalimidopropylmalonic ester, when brominated, gives a monobromo-derivative, which is then hydrolysed and heated to remove one carboxyl group, the resulting compound being phthalimidobromovaleric acid,



$$C_6H_4\langle{}^{CO}_{CO}\rangle N.CH_2.CH_2.CH_2\ CHBr.COOH.$$

This was converted into the amino-derivative, and by splitting off the phthalyl radical the racemic form of natural ornithine was obtained,

$$NH_2.CH_2.CH_2.CH_2.CH(NH_2).COOH.$$

The starting point for the preparation of lysine was Blank's γ-cyanopropylmalonic ester,

$$CN.CH_2.CH_2.CH_2.CH(COOC_2H_5)_2,$$

which is converted by nitrous acid into α-oximino-δ-cyanovaleric ester,

$$CN.CH_2.CH_2.CH_2C(:NOH).COOC_2H_5.$$

The latter, on reduction, yields the racemic form of lysine (αε-diaminocaproic acid). The synthesis of hydroxyamino-acids such as serine of silk fibroin has also been accomplished by applying Strecker's reaction to the hydroxy-aldehydes. Thus ammonia converts the cyanhydrin of glycollic aldehyde into the aminocyanhydrin which on hydrolysis yields inactive serine,

$$CH_2(OH).CHO \longrightarrow CH_2(OH).CH(OH).CN \longrightarrow CH_2(OH).CHNH_2.CN \longrightarrow CH_2(OH).CHNH_2.COOH.$$

Of no less importance to the solution of the albumin problem have been the new methods furnished by Fischer for the separation and identification of the products of proteid hydrolysis, for a correct knowledge of the varied compounds which compose the albumin molecule must necessarily precede any attempt to effect its synthesis. Foremost among these stands the "ester method." It consists in converting the mixture of amino-acids, obtained on hydrolysis, into the corresponding esters, which are then submitted to fractional distillation under very much reduced pressure (10–15 mm.). The method cannot, however, be conveniently applied to the separation of tyrosine or the diamino-acids, which are treated in a different fashion. Space does not permit of more than a passing reference to the formation of benzoyl, formyl, and β-naphthalene sulphonyl derivatives, and of the phenyl hydantoins obtained with phenylisocyanate, all of which have been utilised either in the purification or identification of the amino-acids. We must leave this part of the subject in order to follow Prof. Fischer into the more attractive field of constructive research, and examine the plans which he has laid for attacking the synthetic side of the problem. Simply stated, the object he has had in view has been to link together two, three, four, or more molecules of those amino-acids which the proteids yield on hydrolysis, and by varying the combinations to obtain eventually something resembling the peptones or the simplest albumins. To these artificial combinations of

---

[1] *Vide* Address by Prof. Emil Fischer, "Untersuchungen über Aminosäuren Polypeptide und Proteine" (*Berichte der deutschen Chem. Gesell.*, 1906, xxxix., 530.)

© 1906 Nature Publishing Group